Implications and Recommendations for Service-Oriented Architectures (SOAs)

The New Global Information Economy

SilkRoad

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Co-author: Lt. Gen (Retired) William Donahue.
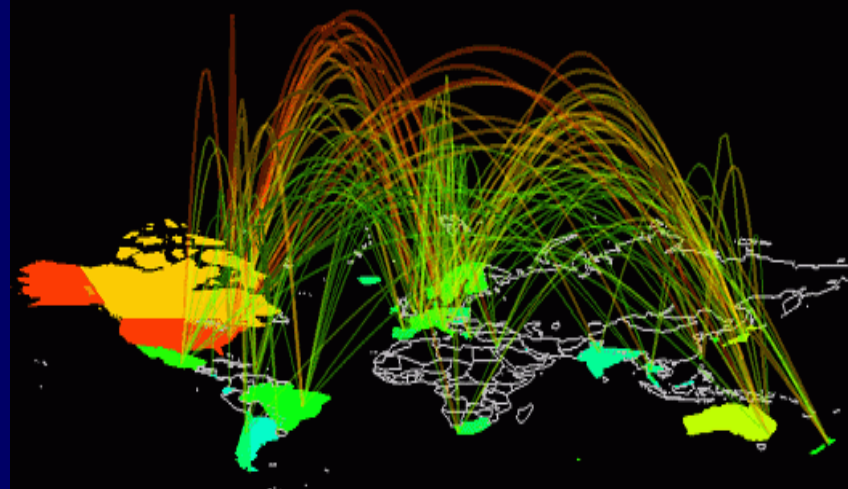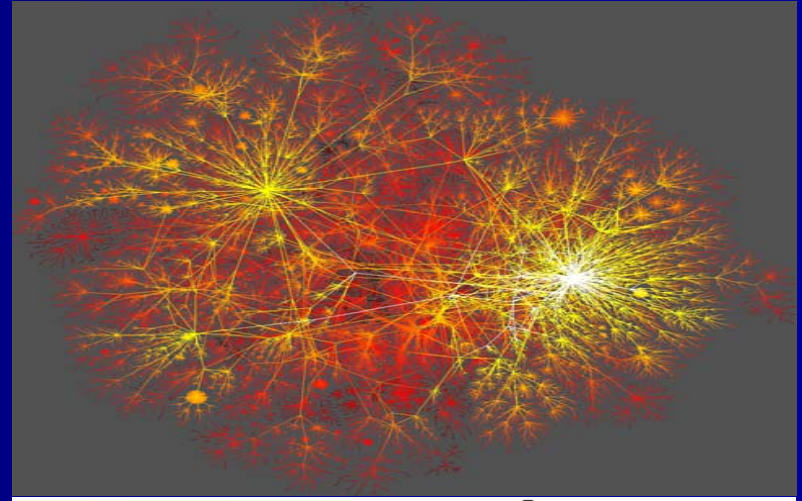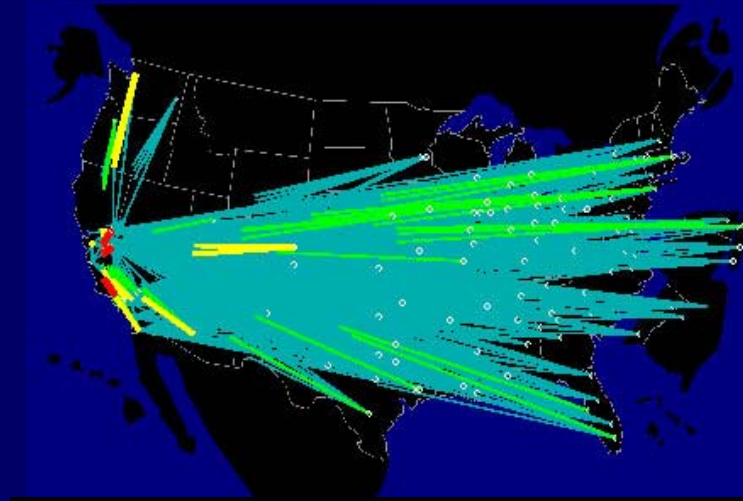
Emerging Concepts

- Information networks are complex systems and the complexity is accelerating.

- The dynamics of complex internets are dominated by the notion of self-organization and emergent behavior at the "edge."

- Net-centric concepts are rapidly evolving to information-centric, peer-to-peer, digital information sharing and digital rights management.

- Information-centric means a transformation from industrial-age economics to information-age economics.

Net-Centric Edge Issues

- **<u>Unpredictable</u>:** ROI is inherently unpredictable.

- **<u>Interdependent:</u>** Critical information assets are controlled by myriad cooperating edge organizations.

- **<u>Inadequate:</u>** Enterprise capital planning and control (CPIC) lifecycles are orders of magnitude longer than "edge" lifecycles and mission requirements.

- **<u>Emergent:</u>** The Enterprise evolves to a boundless self-organizing information ecosystem. Edge organizational requirements dominate the centralized command organizational requirements.
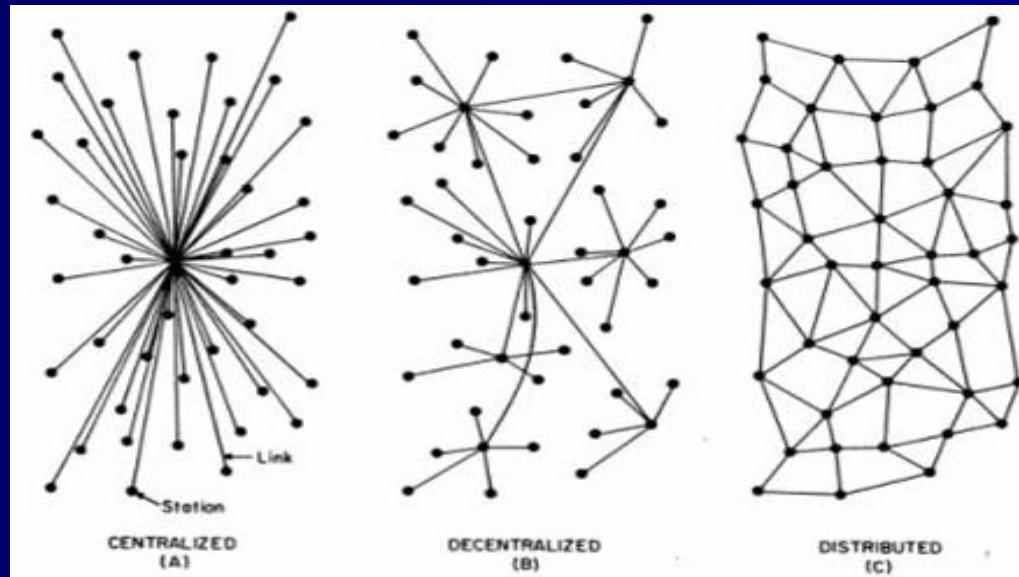
Complex Systems Concepts
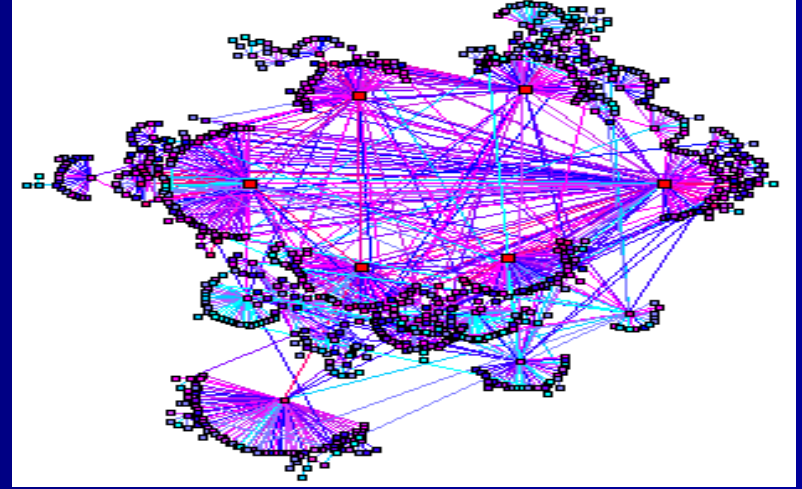
Emerging Edge Concepts: Social & Market Driven

- Self-organization

- Small world theory & hubs

- Scale-free networks

- Information economics and markets
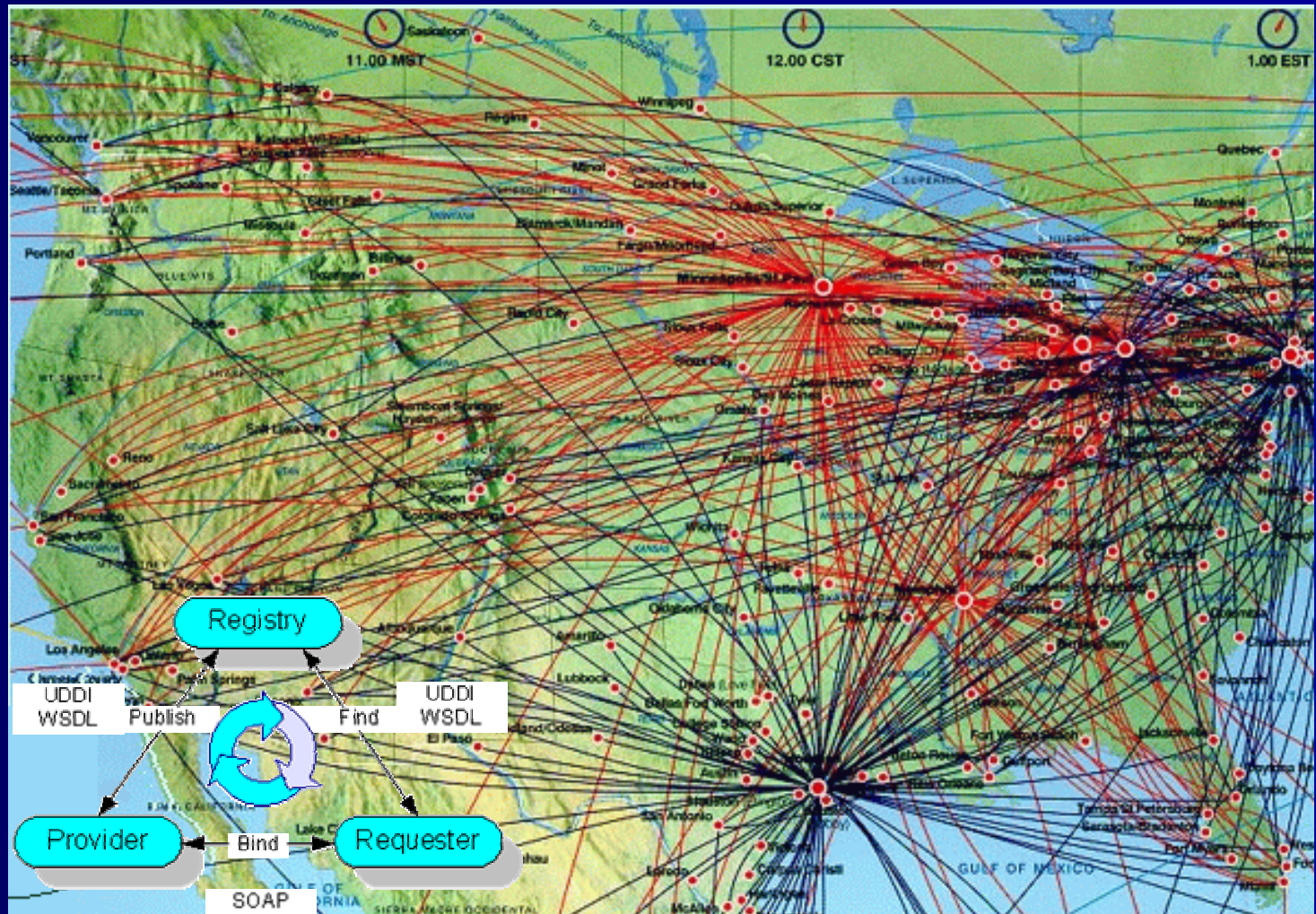
- Digital rights management
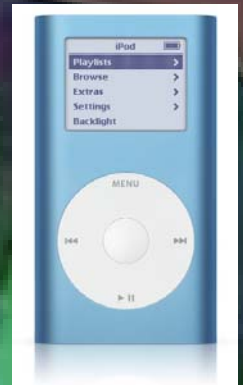
Scale Free Networks & Hubs
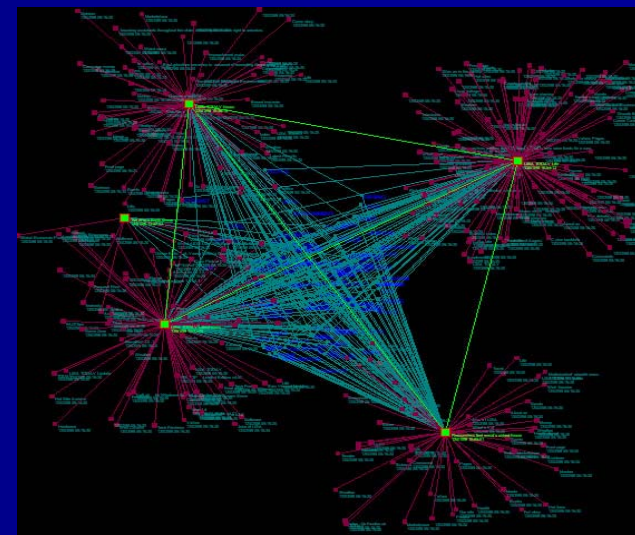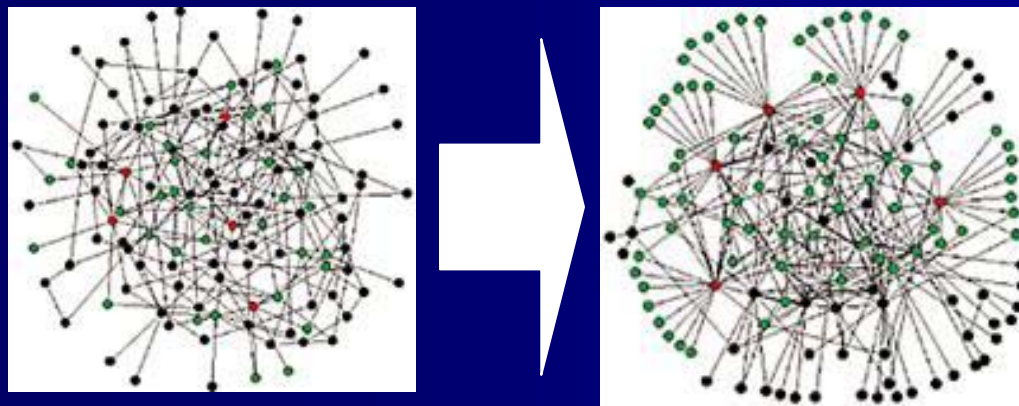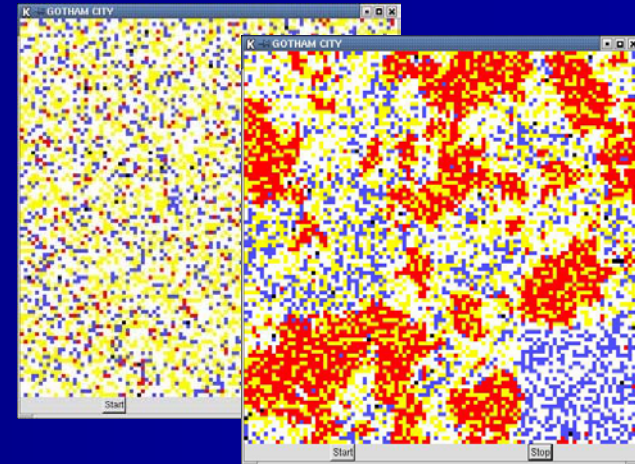
SOA, Hubs and Market Economics – "The Edge"
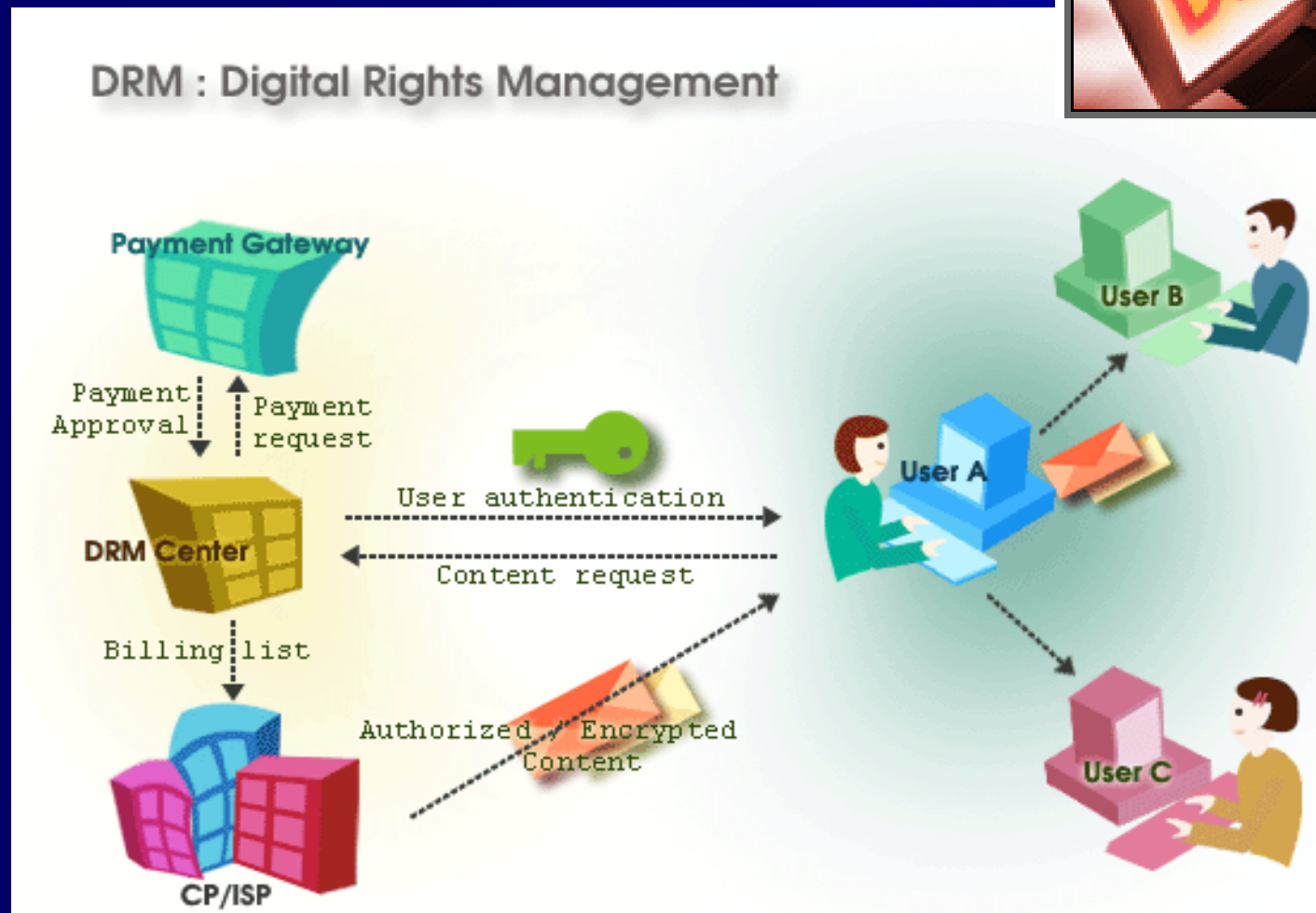
How do We Enable the New Digital Information Economy?

… "Lessons Learned from iTunes."
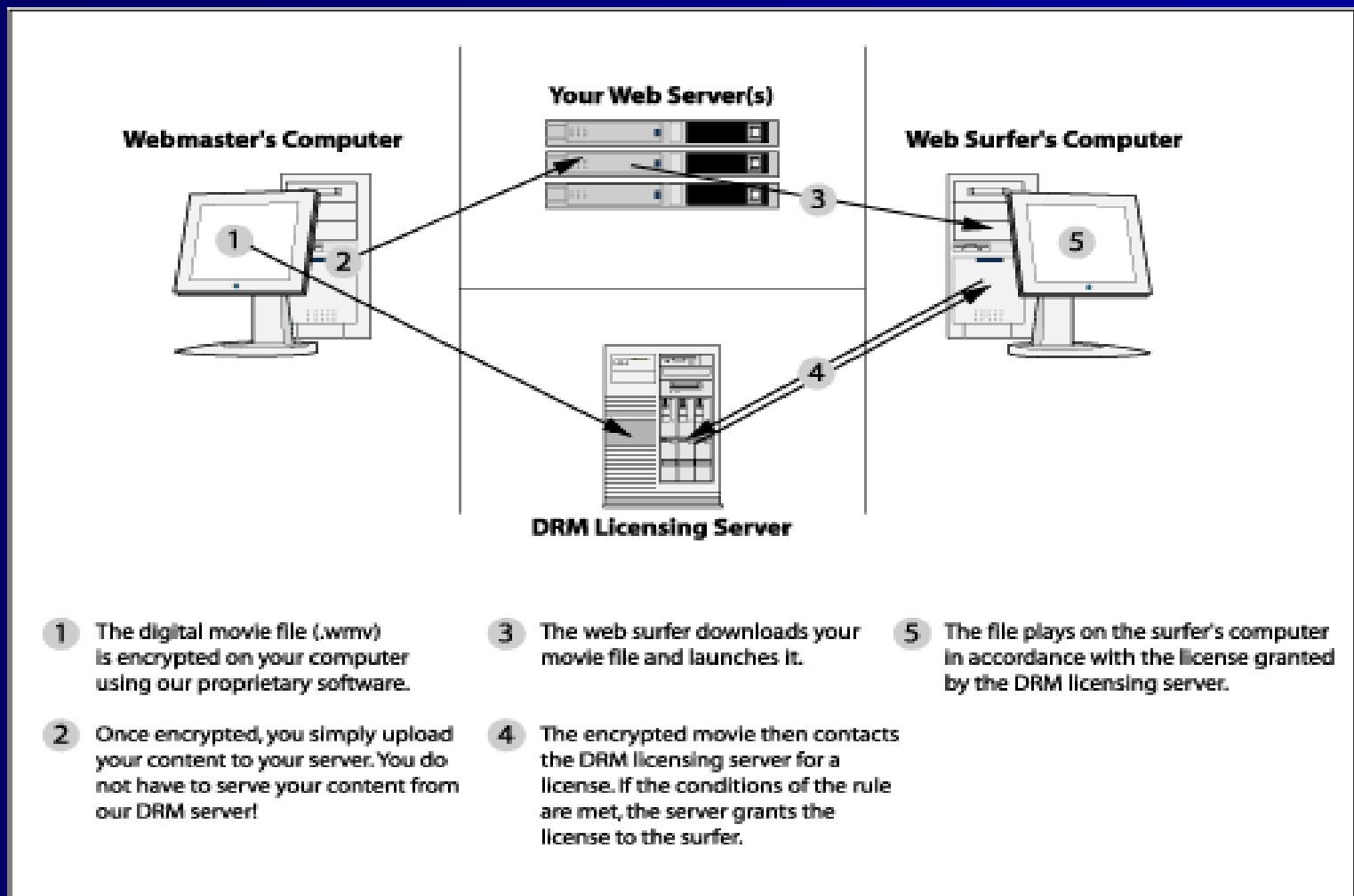
Think Digital Information and Digital Rights!

Think Digital Rights Management!

DRM : Digital Rights Management

Digital Rights Management (DRM)

Your Web Server(s)

Webmaster's Computer

Web Surfer's Computer

DRM Licensing Server

1. The digital movie file (.wmv) is encrypted on your computer using our proprietary software.

2. Once encrypted, you simply upload your content to your server. You do not have to serve your content from our DRM server!

3. The web surfer downloads your movie file and launches it.

4. The encrypted movie then contacts the DRM licensing server for a license. If the conditions of the rule are met, the server grants the license to the surfer.

5. The file plays on the surfer's computer in accordance with the license granted by the DRM licensing server.

Summary:
A Break from Pictures!

- Future edge organizations are all connected in a vast global information economy.

- Information sharing is incentivized by the preservation of digital rights.

- Solves numerous issues around intelligence community information sharing, such as:
  - who saw the data – top secret control process
  - source validation – solves issues of compartmented information
  - full audit trail from cradle to grave

- DoD net-centric goals are facilitated by digital rights management concepts.

SilkRoad's DRM Permission Server Example:

Remarks

- We all must shift our worldview from industrial-age thinking to information-age thinking.

- Future edge organizations are all members of a digital information economy.

- The economics of digital information sharing is facilitated by understanding digital rights, intellectual property rights, digital pedigrees, and all DRM concepts.

- DRM concepts and applications can help enable net-centric goals for the future of C2 in the DoD.

Recall The Prisoner's Dilemma**

"Basic Idea of Cooperation from Classical Game Theory."

SilkRoad	Jones Confesses ("Defection")	Jones Remains Silent ("Cooperation")
Smith Confesses ("Defection")	**Smith and Jones get 5 years each.**	**Jones get 10 years.** **Smith goes free.**
Smith Remains Silent ("Cooperation")	**Smith get 10 years.** **Jones goes free.**	**Smith and Jones get 1 year each.**

** In classical game theory, a situation in which two players must choose between the risks of cooperation and competition as equated with two prisoners separately deciding whether to confess to a crime.   Naturally, the "payoffs" gets more complex as the number of participants increases.

The Prisoner's Dilemma**

"IT Lessons Learned from Classical Game Theory."

SilkRoad	Organization "A" Hoards Information ("Defection")	Organization "A" Shares Information ("Cooperation")
Organization "B" Hoards Information ("Defection")	**"A" and "B" get $5M of funding each.**	**"B" get $10M of funding.** **"A" gets zero.**
Organization "B" Shares Information ("Cooperation")	**"A" get $10M of funding.** **"B" gets zero.**	**"A" and "B" get $3M of funding each.**

** Based on classical game theory, we observe that the "payoff" is higher for those who hoard information. Sharing information can have adverse consequences.

Net-Centric Transformation**

"Changing the rules to facilitate cooperation."

	Organization "A" Hoards Information ("Defection")	Organization "A" Shares Information ("Cooperation")
Organization "B" Hoards Information ("Defection")	**"A" and "B" get $0 dollars of funding each.**	**"B" get $0 funding. "A" gets $4M.**
Organization "B" Shares Information ("Cooperation")	**"A" get $0 funding. "B" gets $4M.**	**"A" and "B" get $3M of funding each.**

** Changing the "rules of the game" where the individual payoffs are higher for sharing information. In this model, the equilibrium point shifts to cooperation v. the established business "rules of the game" that tend to reward information hoarding.

Conclusions

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- SOA is interesting, industrial-age thinking, but SOA does not solve the classical Prisoner's Dilemma for digital information sharing.

- DoD C2 has not shifted from industrial-age thinking to information-age thinking.

- All roads lead to new economic models for digital information sharing and digital rights.

- DRM offers a glimpse into the future of C2 for agile, self-organizing, DoD edge organizations.

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